

Interplanetary Propagation of Coronal Mass Ejections

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Although more than ten thousand coronal mass ejections (CMEs) are produced during each solar cycle at the Sun, only a small fraction hits the Earth. Only a small fraction of the Earth-directed CMEs ultimately arrive at Earth depending on their interaction with the solar wind and other large-scale structures such as coronal holes and CMEs. The interplanetary propagation is essentially controlled by the drag force because the propelling force and the solar gravity are significant only near the Sun. Combined remote-sensing and in situ observations have helped us estimate the influence of the solar wind on the propagation of CMEs. However, these measurements have severe limitations because the remote-sensed and in-situ observations correspond to different portions of the CME. Attempts to overcome this problem are made in two ways: the first is to model the CME and get the space speed of the CME, which can be compared with the in situ speed. The second method is to use stereoscopic observation so that the remote-sensed and in-situ observations make measurements on the Earth-arriving part of CMEs. The Solar Terrestrial Relations Observatory (STEREO) mission observed several such CMEs, which helped understand the interplanetary evolution of these CMEs and to test earlier model results. This paper discusses some of these issues and updates the CME/shock travel time estimates for a number of CMEs.